高等职业教育“十三五”规划教材

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生物技术专业英语

汤卫华　陈　珊　主编

中国轻工业出版社｜全国百佳图书出版单位

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图书在版编目（CIP）数据

生物技术专业英语/汤卫华，陈珊主编. —北京：中国轻工业出版社，2017.6

高等职业教育“十三五”规划教材

ISBN 978-7-5184-1360-7

Ⅰ.①生… Ⅱ.①汤… ②陈… Ⅲ.①生物工程-英语-高等职业教育-教材 Ⅳ.①Q81

中国版本图书馆 CIP 数据核字（2017）第 074035 号

责任编辑：王　朗

策划编辑：江　娟　　责任终审：张乃柬　　封面设计：锋尚设计

版式设计：宋振全　　责任校对：晋　洁　　责任监印：张　可

出版发行：中国轻工业出版社（北京东长安街 6 号，邮编：100740）

印　　刷：三河市万龙印装有限公司

经　　销：各地新华书店

版　　次：2017 年 6 月第 1 版第 1 次印刷

开　　本：720×1000　1/16　印张：16.5

字　　数：321 千字

书　　号：ISBN 978-7-5184-1360-7　定价：40.00 元

邮购电话：010-65241695　传真：65128352

发行电话：010-85119835　85119793　传真：85113293

网　　址：http://www.chlip.com.cn

Email：club@chlip.com.cn

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前　言

《普通高等学校高等职业教育专科（专业）目录（2015年）》是高等职业教育的基本指导性文件，是高校设置与调整高职专业、实施人才培养、组织招生、指导就业的基本依据。《生物技术专业英语》以该目录的专业划分和调整为基础，以高职教育专业理论"必需、够用"为原则，在深度上考虑到高职学生的掌握程度，以浅显易懂为主。目前，适用于高职高专层次的同类教材非常少，而本科教材较多。本教材的优势是遵循高职学生的认知程度，在难度上降低，增强其适用性。另外，80%的参考资料选自5年内出版的书籍或期刊，以提升课本的时效性和前沿性。

本书共分为7个单元，具体编写分工如下：单元1为化学基础知识，由高芦宝编写；单元2为生物化学，由张乐编写；单元3为微生物，由龙尾编写；单元4为发酵工程，由陈珊编写；单元5为酶工程，由汤卫华和闫雪冰编写；单元6为药物制剂，由吕春晖编写；单元7为GMP，由苑鹏编写。每章包括阅读材料、词汇、参考译文及拓展阅读。内容覆盖食品生物技术和药品生物技术的基本领域，突出了行业发展方向。

《生物技术专业英语》可作为食品生物技术、药品生物技术等高职高专专业和应用型本科的专业英语教材或参考用书。

目　录

Unit 1　Chemical Basic Knowledge　化学基础知识

Chapter 1　Atoms and Molecules　分子和原子

1. **Elements** and compounds

There are two types of pure substance: elements and compounds.

- Elements are substances that cannot be **chemically** broken down into simpler substances.
- Compounds are pure substances made from two, or more, elements chemically combined together.

Elements are the "building blocks" from which the Universe is constructed. There are over a hundred known elements, but the vast majority of the Universe consists of just two. **Hydrogen** (92%) and helium (7%) make up most of the mass of the Universe, with all the other elements contributing only 1% to the total. The concentration, or "coming together", of certain of these elements to make the Earth is of great interest and significance. There are 94 elements found naturally on Earth altogether. Two elements, **silicon** and **oxygen**, which are bound together in silicate rocks. Only certain of the elements are able to form the complex compounds that are found in living things. For example, the human body contains 65% oxygen, 18% carbon, 10% hydrogen, 3% **nitrogen**, 2% **calcium** and 2% of other elements.

2. Chemical reactions and physical changes

Substances can mix in a variety of ways, and

New Words and Expressions

element ['elɪmənt]
n. 元素；要素

chemically ['kemɪklɪ]
adv. 用化学，以化学方法

hydrogen ['haɪdrədʒən]
n. 氢

silicon ['sɪlɪkən]
n. 硅；硅元素

oxygen ['ɒksɪdʒən]
n. 氧气，氧

nitrogen ['naɪtrədʒən]
n. 氮

calcium ['kælsiəm]
n. 钙

they can also react chemically with each other. In a reaction, one substance can be transformed (changed) into another. **Copper carbonate** is a green solid, but on heating it is changed into a black powder (Figure 1-1). Closer investigation shows that the gas **carbon dioxide** is also produced. This type of chemical reaction, where a compound breaks down to form two or more substances, is known as **decomposition.**

copper carbonate ['kɔpə 'kaːbəneit] *n.* 碳酸铜

carbon dioxide ['kaːbən daɪ'ɔksaɪd] *n.* 二氧化碳

decomposition [diːkɒmpə'zɪʃn] *n.* 分解，腐烂；变质

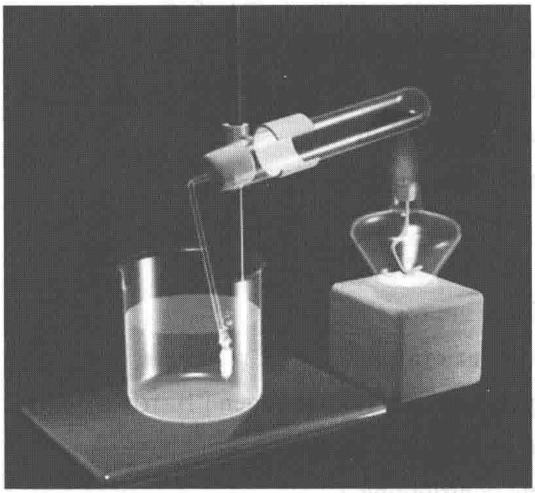

Figure 1-1　Heating copper carbonate

Decomposition can also be brought about by electricity. Some substances, although they do not conduct electricity when solid, do conduct when they are melted or in solution. In the process of conduction, they are broken down into simpler substances. Thus, lead (II) **bromide**, which is a white powder, can be melted. When a current is passed through molten lead (II) bromide, a **silver-grey** metal (lead) and a brown vapour (bromine) are formed. Neither of these products can be split into any simpler substances.

bromide ['brəʊmaɪd] *n.* 溴化物

silver-grey ['silvə'grei] *n.* 银灰色

The opposite type of reaction, where the substance is formed by the combination of two or more other substances, is known as **synthesis**. For example, if a pieced of burning magnesium is plunged into a gas jar of oxygen, the intensity (brightness) of the brilliant white flame increase. When the reaction has burnt out, a white ash remains (Figure 1-2). The ash has totally different properties form the original silver-grey metal strip and colorless gas we started with. A new compound, **magnesium oxide,** has been formed from magnesium and oxygen.

synthesis ['sɪnθɪsɪs]
n. 合成；综合体

magnesium oxide
[mæg'niːziːəm 'ɔksaid]
n. 氧化镁

Figure 1-2 Burning magnesium produces a brilliant white flame

Although many other reactions are not as spectacular as this, the burning of magnesium shows the general features of chemical reactions.

3. **Atoms** and molecules

atom ['ætəm]
n. 原子；原子能

The molecular structure hypothesis-that a molecule is a collection of atoms linked by a network of **bonds** was forged in the crucible of nineteenth century experimental chemistry. It has continued to serve as the principal means of ordering and classifying the observations of chemistry. The difficulty with this hypothesis was that it was not related directly to **quantum**

bond [bɒnd]
n. 化学键

quantum ['kwɒntəm]
n. 量子；定量，总量

mechanics, the physics which governs the motions of the **nuclei** and electrons that make up the atoms and the bonds. Indeed, there was, and with some there still is, a prevailing opinion that these fundamental concepts, while unquestionably useful, were beyond theoretical definition. We have in chemistry an understanding based on a classification scheme that is both powerful and at the same time, because of its empirical nature, limited.	nuclei ['njuːklɪaɪ] *n.* 核心，核子；原子核
Richard Feynman and Julian Schwinger have given us a reformulation of physics that enables one to pose and answer the questions "what is an atom in a molecule and how does one predict its properties?" These questions were posed in my laboratory where it was demonstrated that this new formulation of physics, when applied to the observed **topology** of the distribution of **electronic charge** in real space, yields a unique partitioning of some total system into a set of bounded spatial regions. The form and properties of the groups so defined faithfully recover the characteristics ascribed to the atoms and functional groups of chemistry. By establishing this association, the molecular structure hypothesis is freed from its empirical constraints and the full predictive power of quantum mechanics can be incorporated into the resulting theory-a theory of atoms in molecules and crystals.	topology [tə'pɒlədʒɪ] *n.* 拓扑结构 electronic charge [ilek'trɔnik tʃɑːdʒ] *n.* 电子电荷
The theory recovers the central operational concepts of the molecular structure hypothesis, that of a functional grouping of atoms with an additive and characteristic set of properties, together with a definition of the bonds that link the atoms and impart the structure. Not only does the theory	

thereby quantify and provide the physical understanding of the existing concepts of chemistry, it makes possible new applications of theory. These new applications will eventually enable one to perform on a computer, in a manner directly paralleling experiment, everything that can now be done in the laboratory, but more quickly and more efficiently, by linking together the functional groups of theory. These applications include the design and synthesis of new molecules and new materials with specific desirable properties.

Matter is composed of atoms. This is a consequence of the manner in which the electrons are distributed throughout space in the attractive field exerted by the nuclei. The nuclei act as point attractors immersed in a cloud of **negative charge**, the **electron density** (r). The electron density describes the manner in which the electronic charge is distributed throughout real space. The electron density is a measurable property and it determines the appearance and form of matter. This is illustrated in the following figures. Figure 1-3 displays the spatial distribution of the electron density in the plane containing the two carbon and four hydrogen nuclei of the **ethane** molecule. The electron density is a maximum at the position of each nucleus and decays rapidly away from these positions. When this diagram is translated into three dimensions, the cloud of negative charge is seen to be most dense at **nuclear** positions and to become more diffuse as one moves away from these centres of attraction, as illustrated in Figure 1-3.

negative charge ['negətiv tʃɑːdʒ] *n.* 负电荷

electron density [ɪ'lektrɑn 'densiti] *n.* 电子密度

ethane ['eθiːn] *n.* 乙烯

nuclear ['njuːklɪə] *adj.* 原子能的；细胞核的；中心的；原子核的

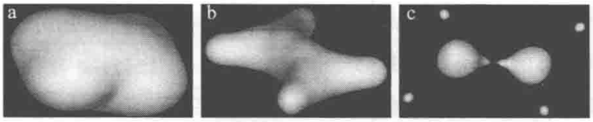

Figure 1-3 Envelopes of the electron density for the ethene molecule

参考译文

1. 元素和化合物

纯物质有两种，元素和化合物。

- 元素不能够通过化学方法分解成为更简单的物质。
- 化合物是由两个或者更多化学元素组合在一起的物质。

元素是构成世界的“基石”。目前已知的元素有一百多种，但是构成宇宙中绝大多数的物质主要有两种，氢（92%）和氦（7%）。这两种元素在宇宙的物质中占到了很高的质量分数，其他元素只占总体质量分数1%的浓度，但这些元素对于世界物质的构成具有极大的意义。在自然界存在着94种元素。硅和氧两种元素共同存在于硅酸盐岩石中。在生物体中只有特定的元素可以形成复杂的化合物，例如，人体包含65%的氧、18%的碳、10%的氢、3%的氮、2%的钙和2%的其他元素。

2. 化学反应和物理变化

物质的混合方式有多种，不同物质之间还可以发生化学反应。在一种反应中，一种物质可通过反应变成另一种新物质。碳酸铜是一个绿色的固体，通过加热可以变成黑色粉末状物质（图1-1）。反应同时也会产生二氧化碳气体。这种类型的化学反应，将一种化合物进行分成两个或两个以上的物质称为分解反应。

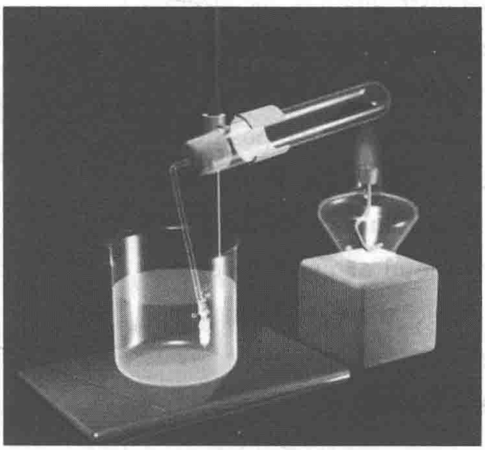

图1-1 加热碳酸铜

一些溶解在溶液中的物质尽管不导电，也可以通过电解的方式进行分解反应。在反应过程中，它们被分解成结构更简单的物质。因此，白色粉末状的溴化铅可以被溶解。当溴化铅被电解时，会产生银灰色的金属铅和棕色的溴气。这两种物质不能再进一步分解。

与分解反应相反，由两种或两种以上物质合成为一种物质的反应称为合成。例如，将镁放入氧气罐中燃烧会产生亮白色的火焰。反应完毕后会出现白色的灰状物质（图 1-2）。这种物质与银色金属物质和气体物质的性质完全不同，这是一种新的化合物氧化镁，是由镁和氧气合成的。

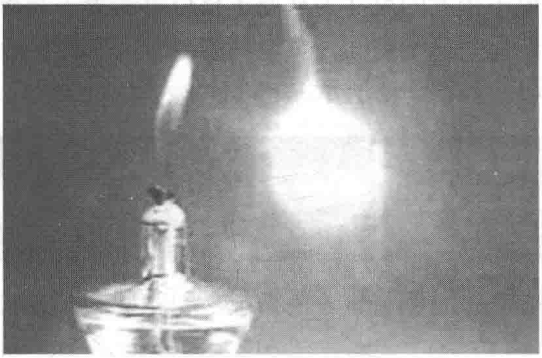

图 1-2 燃烧镁产生的白色火焰

虽然其他一些反应不像此反应这么强烈，但是镁的燃烧反应体现了化学反应的普遍特征。

3. 原子和分子

分子结构的假说，一个分子是由原子以网状结构连接而形成的集合体，这是 19 世纪进行化学实验得出的结论。这种方法一直成为化学研究的主要手段。这一假设的难点是它与量子力学没有直接的关系，原子核和电子的运动构成了原子及其连接机构。实际上还有一些流行的观点认为这些基本概念已经超出了基础理论的认知。基于专业分类体制，我们对化学领域的研究具备了有效性以及同时性，但是由于经验的缺乏我们的研究还是有限制的。

理查德·费曼物理学和朱利安·施温格提出并回答了一个问题“什么是原子和分子，如何预测它的属性？”在我的实验室里当应用于观察到的拓扑分布的电子电荷在现实空间中产生了一个独特的一些总系统，并划分为一组有限的空间区域时，这个问题被新的公式证明了。功能团的形成方式和特点定义为原子和官能团的化学。通过建立这种联系，分子结构假说从其经验约束和量子力学的理论完整推测可以得出最终的理论——原子和分子以及晶体的理论。

这个理论引出了分子结构假说理论的核心概念：原子功能团的特征以及性质，以及连接原子的结构和定义。这些理论从量化的角度帮助理解了现有的化学

理论及概念，它使得新的理论有了应用的空间。这些新的理论在实验室中就可以完成研究，通过应用程序的方式，利用计算机模拟以及实验的方法来观察，能够更有效地发现官能团的研究理论。这些应用程序包括新分子的设计和合成、新材料与特定的属性。

物质是由原子组成的，这是由电子的分布方式以及原子核空间的吸引力决定的。原子核将负电荷电子吸引到电子云周边。电子密度（r）是描述电子的方式在真实空间电荷分布的物理量。电子密度是一个可测量物理量，它决定了原子的外观和性质。图 1-3 显示了在平面上乙烯分子的电子密度空间分布，包含两个碳和四个氢原子核。电子密度的尺寸为从原子核位置起由于衰减的原因远离核的最长距离。当这个图转化为三维空间，负电荷的电子云从核中心的密集区变得更加分散，逐渐远离中心，如图 1-3 所示。

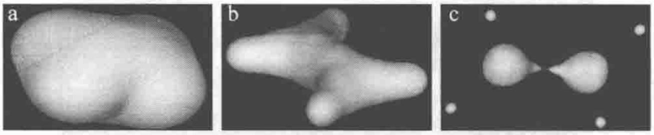

图 1-3　乙烯分子的电子密度

Further Reading

Elements and Compounds

Elements and Compounds All matter is composed of basic substances called elements. An element cannot be broken down into simpler units by chemical reactions; it contains only one kind of atom. An atom is the smallest characteristic unit of an element. A compound is a substance that can be split into two or more elements. Water is a compound because it can be split into its components, hydrogen and oxygen. The **formula** of a compound gives information about the kinds and numbers of atoms that make up each molecule of that compound. A formula contains the symbols of the kinds of atom in each molecule and subscripts that indicate the number of each kind of atom in the molecule. For example, the formula for water, H_2O, indicates that a water molecule contains two hydrogen atoms and one oxygen atom; and a molecule of the glucose, $C_6H_{12}O_6$, contains six carbon atoms, twelve hydrogen atoms, and six oxygen atoms. When carbon unites with oxygen, it forms a colorless, odorless, and tasteless gas called carbon dioxide, which is heavier than air and will extinguish a flame. Carbon dioxide is like nitrogen in many ways, but if it is mixed with limewater, it causes the clear liquid to because milky, while nitrogen dose not. This is the test for carbon dioxide. Carbon dioxide is a source of plant food. Plant has the power to take this gas from the air, combine it with water, and make it into their tissues; in fact, it is from this source that all organic carbon comes. **Mineral** compounds are made of elements such as **sulphur**, phosphorus, iron, potassium, sodium, and calcium. Calcium unites with sulphur and oxygen to form calcium sulphate, and phosphors and oxygen to form calcium phosphate, sodium and potassium unite with oxygen and nitrogen to form sodium to potassium nitrates.

New Words

formula ['fɔːmjʊlə] *adj.* 配方

mineral ['mɪnərəl] *n.* 矿物

sulphur ['sʌlfə] *n.* 硫黄；硫黄色

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